

Drinking Water Information

About trihalomethanes in drinking water

What are Trihalomethanes (THMs)?

Trihalomethanes (THMs) are a group of compounds (chloroform, bromodichloromethane, chlorodibromomethane, and bromoform) that form when chlorine used for the disinfection of drinking water reacts with naturally occurring organic matter such as decaying plant material found in lakes, rivers and streams. THMs are classified as disinfection by-products (DBPs).

How might I be exposed to THMs?

The most common route for general public exposure to THMs is through drinking chlorinated surface water. The level of exposure to THMs will depend on the amount of naturally occurring organic matter found in the surface water, the amount of chlorine used and the form in which it is applied in the disinfection process (free chlorine, chloramine or chlorine dioxide). A secondary exposure can be through inhalation of vapours released during showering or under certain conditions from chlorinated water in swimming pools. Drinking water systems using groundwater are less likely to have THM formation due to lower levels of naturally occurring organic matter.

What happens to THMs when they enter the environment?

THMs, being volatile, can dissipate to the air from water and can be slowly broken down by reactions with other chemicals as well as by sunlight. THMs do not build up in the food chain.

Does Ontario have a Drinking Water Quality Standard for THMs?

Yes. The Ontario Drinking Water Quality Standard (ODWQS) for THMs is 0.100 mg/L (100 ug/L). This maximum acceptable concentration, based on a running annual average, was established as an Ontario Drinking Water Objective in 1993 and adopted as an ODWQS in 2000. Considerable progress in evaluating human health impacts has been made since 1993 and the maximum acceptable concentration was re-assessed by Health Canada in 2006. Health Canada reaffirmed the guideline for THMs at 0.100 mg/L however established a new guideline of 0.016 mg/L for bromodichloromethane (BDCM), one of the four chemicals used to calculate total THMs.

Ontario consulted on a more stringent standard of 0.080 mg/L (80 ug/L) for THMs, based on a locational running annual average concentration, in April 2006. Ontario is currently reviewing the adoption of a more stringent ODWQS of 0.080 mg/L for THMs. This new, more stringent standard will promote good operating practices at drinking-water treatment plants and be phased-in over a period of time.

Maximum acceptable concentrations are very conservative and the limits are set very low. The maximum acceptable concentrations for THMs and BDCM are based on a lifetime exposure considering the most vulnerable subpopulation.

Is my drinking water monitored for THMs?

Under the Ontario Drinking-Water Systems Regulation 170/03, the owner/operator of a municipal or non-municipal year-round residential drinking water system that disinfects with chlorine must sample the distribution system at least once every three months and test for THMs. A running annual average is calculated based on the results for the past four quarters.

In addition, the Ministry of the Environment monitors THMs at a number of municipal drinking water systems based on samples submitted to the ministry for testing under the Drinking Water Surveillance Program (DWSP).

Note: A running annual average is calculated every quarter using the results from the past four quarters. A single result, greater than the maximum acceptable concentration, is not interpreted as an exceedence of the ODWQS.

How can THMs affect my health?

The health effects of THMs on humans are inconclusive. Results from scientific studies on laboratory animals have shown links between exposure to specific THMs and tumours in mice and rats. Human studies show data consistent with these findings. Human studies also suggest a link between reproductive effects and exposure to high levels of THMs.

Preliminary animal studies indicate that BDCM and other trihalomethanes containing bromine may be more toxic than the chlorinated forms. BDCM is considered to be a probable carcinogen in humans based on animal studies. Exposure to BDCM at high levels has been linked to a possible increase in reproductive effects.

Disinfection, the destruction or inactivation of pathogenic organisms, is the most important step in any water treatment process. It is important to note that disinfection by chlorination kills or inactivates microbes and pathogens and has nearly eliminated waterborne microbial diseases in humans. For this reason, both federal and provincial health agencies state that the proven health risks to Canadians from micro-organisms when water is not properly disinfected outweigh the possible health risks from THMs.

How are THMs removed from drinking water?

There are a number of options to reduce THM levels in drinking water. The preferred and most cost effective method for a municipal drinking-water system is to control THM formation by removing the organic matter prior to chlorination. This is achieved through conventional treatment (coagulation and sedimentation followed by filtration) and the use of granular activated carbon (GAC). Replacing chlorine with an alternative disinfectant is another possible method to control THM formation. Ozone, chlorine dioxide, chloramines and ultraviolet light are alternatives to conventional chlorine disinfection which eliminate or reduce the formation of THMs.

If your residence relies on water from a private well as a source of drinking water and chlorine is not used for disinfection, you will not have THMs in your water. If you do add chlorine to your well water and wish to test for THMs, this testing can be done by any private laboratory at a cost of about \$125 per sample. A list of the laboratories in your area can be found on the Ministry of the Environment web site at:

http://www.ene.gov.on.ca/en/water/sdwa/license_dlabs.php

In an individual private water supply, THM levels can be reduced using a point-of-entry (POE) device that treat all of the water entering a household or point-of-use (POU) device to treat the water at the tap mainly used for drinking and cooking purposes. The most suitable devices for individual household water supplies are activated carbon and reverse osmosis (RO) technology.

If you would like other guides and fact sheets related to drinking water, please contact the Ministry of the Environment's Public Information Centre at: 1-800-565-4923 or visit the Ministry of the Environment's website at: www.ene.gov.on.ca

References:

Health Canada (2006) Guidelines for Canadian Drinking Water Quality
http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/index_e.html

Health Canada (2006) Trihalomethanes
http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/trihalomethanes/index_e.html